



FOREST PEST CONDITIONS IN WISCONSIN

ANNUAL REPORT 1995

DEPARTMENT OF NATURAL RESOURCES
BOX 7921
MADISON, WISCONSIN 53707

FOREST PEST CONDITIONS IN WISCONSIN ANNUAL REPORT - 1995

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**DEPARTMENT OF NATURAL RESOURCES
Division of Resource Management
Bureau of Forestry**

ACKNOWLEDGMENTS

This record of activities of forest pests and other destructive agents of growing trees in Wisconsin's forest nurseries, plantations, and natural timber areas was made possible by the dedicated work of pest management personnel in each district and at the Forest Pest Management Laboratory in Madison. Department of Natural Resources foresters, other department field personnel, cooperators in other public agencies and private forest industry contributed valuable assistance in monitoring the forest lands in all classes of forest ownership.

Preparation of this Annual Report was a result of a team effort involving Andrea Diss, William Kearby, Todd Lanigan, and Shane Weber, DNR District Pest Specialists who submitted district reports. Jane Cummings Carlson and Dave Hall, Forest Pest Unit, Madison, consolidated the district reports and wrote the draft, and Stephanie Sieger compiled the final report. Printing was done by the DNR Bureau of Administrative and Field Services.

A handwritten signature in black ink, appearing to read "Allen J. Prey". The signature is fluid and cursive, with the first name "Allen" being more prominent than the last name "Prey".

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Supervisor, Forest Pest Management**

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Forest Pest Management Personnel - December 31, 1995**

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INTRODUCTION

In 1995, insect and disease detection surveys were conducted on 5.3 million acres and evaluation surveys on 5.5 million acres. In addition, Wisconsin DNR district pest specialists continued to teach integrated pest management principles to Wisconsin DNR foresters, industrial foresters, and private woodland owners. District forest pest specialists and forest pest unit staff provided a wide variety of programs and information on forest pests in 1995. Approximately 4000 individuals were educated at 77 different training sessions.

OUTREACH

Presentations on IPM practices and updates on specific pest problems were given to the following groups and meetings: Wisconsin Woodland Owners Association; UW Stevens Point students; UW LaCrosse students; Midwest Forest Stewardship Conference; Walnut Council; Wisconsin Arborists Association; Forest Productivity Council; Wisconsin Christmas Tree Producers Association; Bureau of Forestry staff; DATCP board meeting; Elementary schools; Forest Pest Advisory & Steering Council; Wisconsin Electric Power Co.; officials and the general public in Winnebago, Brown, Oconto, Sheboygan, Kewaunee, Marinette, Manitowoc, Eau Claire, Dane, Peshtigo counties (gypsy moth); Kiwanis club, and 4-H Summer Education Program.

Numerous radio interviews and press releases were conducted on topics including gypsy moth biology, trapping and management; oak wilt biology and management; ticks; jack pine budworm; and mosquitoes.

Presentations were made at the following professional meetings: American Phytopathological Society annual meeting; Audubon Society meeting; North Central Forest Pest Workshop; Wisconsin Arborists Association statewide meeting; and Wisconsin Society of American Foresters.

The forest management exhibit showcasing the gypsy moth, oak wilt, walnut freeze injury and other pests was displayed at meetings of the following associations; Wisconsin Woodland Owners; Wisconsin Christmas tree growers; and various DNR district and area meetings and county fairs.

TRAINING

The forest health monitoring (FHM) crews (approximately 70 people) in the Lake State region were trained in FHM data collection. The forest inventory and analysis crews were trained in the new coding system for the lake states. Foresters, Christmas tree growers and woodland owners were trained on various topics including: identification and management of needlecast diseases; gypsy moth biology and silviculture; oak wilt biology and management; Karner blue butterfly; vegetation management; jack pine budworm; birch leaf miner; and walnut freeze injury. Hazard tree training was also conducted for DNR Park Managers.

Some or all of the forest pest specialists and forest pest staff attended numerous training sessions including: forest vegetation management; DNR computer training courses; hazardous materials; North Central Forest Pest Workshop; USFS Sketch Mapping; TQM; Wisconsin/ Michigan border pests; and a tropical ecology field excursion with U.W. Stevens Point students to Costa Rica.

MEETINGS

Some or all of the forest pest specialists and forest pest staff attended the following meetings: USDA Forest Service state cooperators meeting; North Central Forest Pest Workshop; American Phytopathological Society annual meeting; Forest Health Monitoring planning sessions; Michigan and Wisconsin Christmas Tree Growers Association meetings; Gypsy Moth National Review Meeting; and North American Maple Project Review.

REPORTS, PAPERS, AND PROJECTS

The following reports were completed: forest pest situation; accomplishment report and the annual report of forest pest conditions. Information sheets were written on herbicides for forestry; gypsy moth silviculture for northern hardwoods; gypsy moth implementation plan, and Kermes scale on oak. Worked with woodland owners and citizens on forest management issues for disease control on the Northern Highland State Forest. Organized a team of Forest Service and University researchers to develop a biological control technique for chestnut blight. Worked with the Bureau of Endangered Resources and woodland owners to initiate a butternut recovery program.

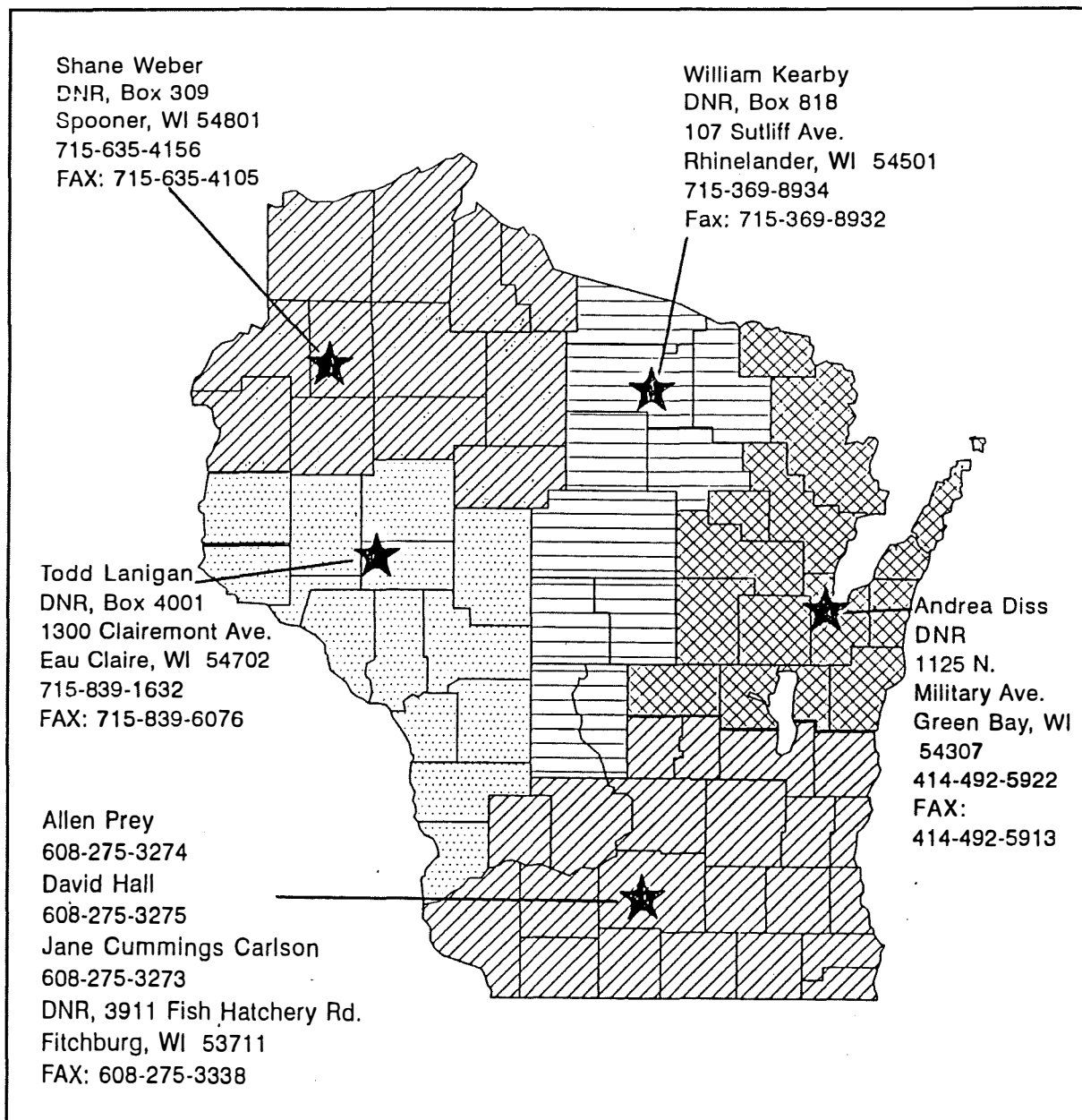


Figure 1. Station locations of Wisconsin Department of Natural Resources District Entomologists and Forest Pest Unit Personnel.

FOREST PEST CONDITIONS IN WISCONSIN ANNUAL REPORT 1995

ASH

Ash Flowergall Mite - *Eriophyes fraxiniflora* Felt

This gall-making mite caused unsightly galls on urban and yard trees throughout the Western District.

Ash Plant Bug - *Tropidosteptes amoenus*

Moderate to heavy populations caused noticeable leaf fall and crown thinning in Eau Claire, La Crosse, Washburn and Barron counties.

Nectria Canker - *Nectria galligena* Bres.

This canker was observed on white ash on the Menominee Indian Reservation in northeastern Wisconsin.

ASPEN

Forest Tent Caterpillar - *Malacosoma disstria* (Hubner)

Populations continued at very low levels. No defoliation was reported in any of the old outbreak areas in the northern counties. Individual caterpillars were collected in several southern counties.

Aspen Blotch Miner - *Phyllonorycter tremuloidiella* (Braun)

Heavy mining caused leaf mortality in northern Langlade, Lincoln, Oneida, Vilas, and southern Forest counties. Injury was most prevalent in roadside stands of second and third year sprouts and stands 20 to 30 feet in height.

Defoliation was present across the northwestern portion of the state with heavy defoliation in Sawyer, Price, Rusk, Ashland and Iron counties.

Spotty leaf mining occurred in quaking aspen in Marinette, Oconto and Shawano counties.

BALSAM FIR

Spruce Budworm - *Choristoneura fumiferana* (Clemens)

No defoliation was observed on native balsam fir in northwestern Wisconsin. Egg mass surveys indicate no increase in the population within the next year.

Balsam Gall Midge - *Paradiplosis tumifex* (Gagne)

Populations of this insect decreased in the north-central counties. No reports of damage were received.

Balsam Twig Aphid - *Mindarus abietinus* (Koch)

Light damage occurred in a stressed 15-year-old balsam stand in Door County

Balsam Fir Sawfly - *Neodiprion abietis* (Harris)

Light defoliation occurred in a 15-year-old balsam fir stand in Door County.

Balsam Fir Needle Cast and Blight - *Lirula nervata* (Dark.) Dark., *L. mirabilis* (Dark.) Dark., *Rhizosphaera pini* (Cda.) Maubl.

These diseases were observed throughout the northern wild balsams and in Christmas tree plantations. Infection is often prevalent in low-lying areas, shaded areas and places where trees are crowded together. Areas where young balsam fir have seeded in and are surrounded by tall fir can be an ideal environment for high levels of disease. Young fir trees near windbreaks and trees adjacent to densely forested areas are commonly infected.

In northwestern Wisconsin, this disease was prevalent (Table 1); damage appeared to be more serious in native balsam stands. It causes problems for balsam bough collectors as the infected, brown needles are retained and make the boughs unusable for wreaths. The impact on Christmas tree growers in northwestern Wisconsin appears to be low.

Table 1. Locations of balsam fir and spruce infected with *Lirula* spp., 1995.

Site	Causal Organism
<u>Forest Co.</u> , Crandon, WI T35N, R13E, Sec. 8, NWSE	<i>Lirula mirabilis</i> Balsam fir in cottage yard
<u>Forest Co.</u> , Crandon, WI T35N, R13E, Sec. 8, NWSE	<i>Lirula macrospora</i> White spruce by cottage
<u>Langlade Co.</u> , Twp. Ackley T31N, R10E, Sec. 14, SW1/4, W1/2	<i>Lirula mirabilis</i> Balsam fir Christmas tree plantation
<u>Langlade Co.</u> , Bryant	<i>Lirula macrospora</i> White spruce, ornamental planting
<u>Langlade Co.</u> , Twp. Evergreen T31N, R13E, Sec. 21, NWSW	<i>Lirula mirabilis</i> Balsam fir, Christmas tree plantation
<u>Marinette Co.</u> , Wausaukee	<i>Lirula nervata</i> Fraser fir, Christmas tree plantation
<u>Oneida Co.</u> , T38N, R7E, Sec. 10, SENW	<i>Lirula macrospora</i> White spruce, 28-year-old stand
<u>Oneida Co.</u> , Twp. Lake Tomahawk T38N, R7E, Sec. 10, SWNE	<i>Lirula macrospora</i> White spruce, plantation
<u>Oneida Co.</u> , Twp. Piehl T37N, R11E, Sec. 8, SWNW	<i>Lirula mirabilis</i> Balsam fir, natural stand
<u>Vilas Co.</u> , T42N, R , Sec. 2, NENW	<i>Lirula mirabilis</i> natural stand
<u>Vilas Co.</u> , Twp. Boulder Jct. T42N, R6E, Sec. 10, NWSE	<i>Lirula mirabilis</i> & gall midge, Balsam fir, natural stand
<u>Vilas Co.</u> , Twp. Germain T40N, R8E, Sec. 10, SENE	<i>Lirula mirabilis</i> Balsam fir, natural stand
<u>Vilas Co.</u> , Twp. Land O' Lakes T42-43N, R8E, Sec. 35, SWSE	<i>Lirula nervata</i> Balsam fir, natural stand

BASSWOOD

Linden Looper - *Erannis tiliaria* (Harris)

Patches of heavy defoliation of basswood and sugar maple occurred on Rock Island in Door County.

Introduced Basswood Thrips - *Thrips calcaratus* Uzel

These tiny leaf feeders caused scattered, light damage to basswood in Menominee County.

The year of 1995 witnessed a dramatic resurgence of introduced basswood thrips to northwestern Wisconsin. After years of relative calm, basswood trees came under heavy assault in the Blue Hills of Rusk County and the adjacent Meteor Hills of Sawyer County. Moderate to heavy defoliation occurred on 60,000 acres in Rusk County and 22,500 acres in Sawyer County (Figure 2). While the trees should recover nicely from this level of defoliation, this may mark the first year of another protracted struggle between the tough but lovely lindens and this minuscule menace. In other words, introduced basswood thrips defoliation is expected to continue through 1996 and beyond.

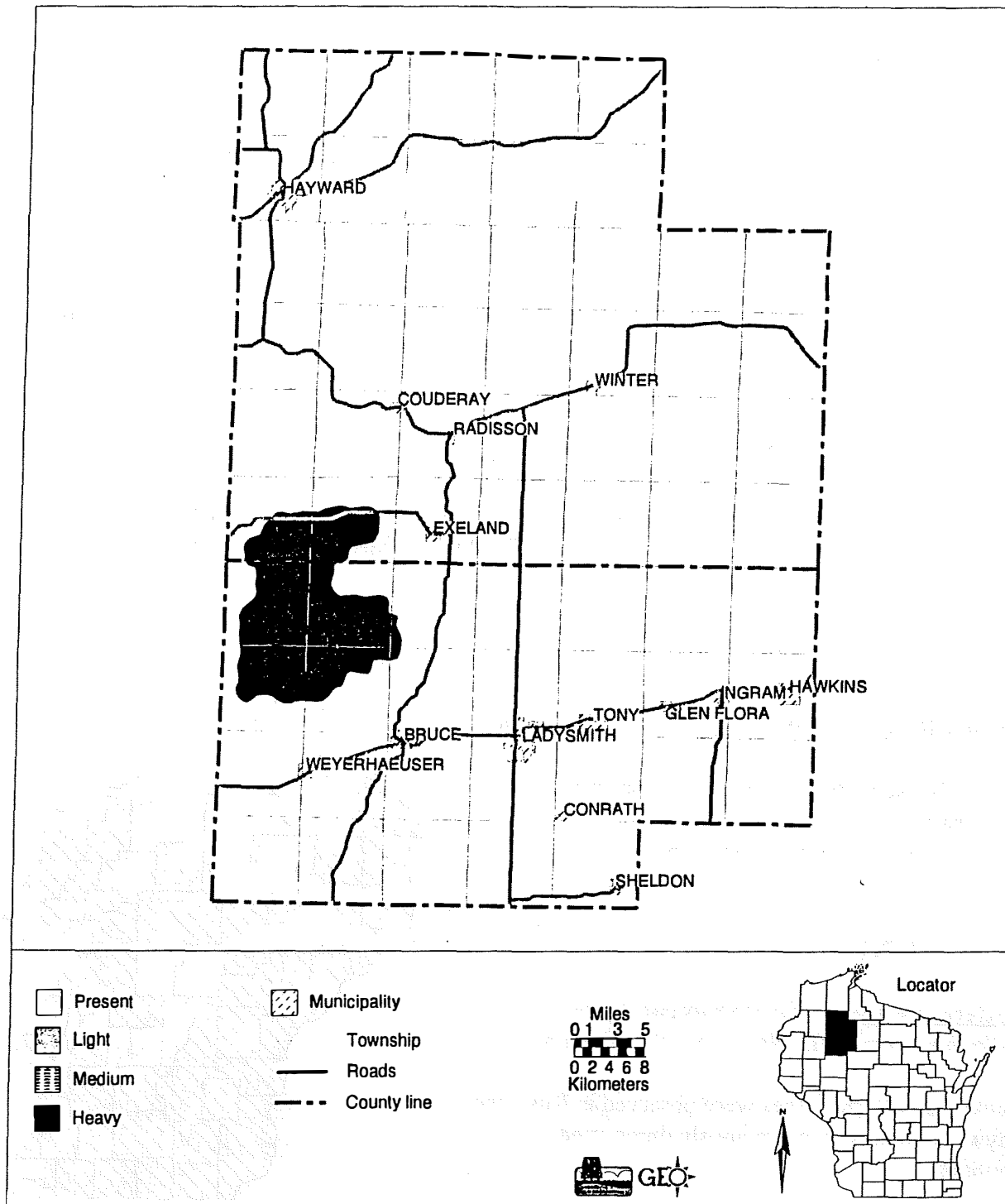


Figure 2. Area of medium - heavy defoliation of basswood by the introduced basswood thrips, Rusk and Sawyer counties, 1995.

BIRCH

White Birch Dieback and Mortality - Drought

White birch continues to recover in north-central Wisconsin. Monitoring plots in Oneida County show no change in health status. The white birch in northwestern Wisconsin did not show signs of decline in 1995.

Birch Leafminer - *Fenusa pusilla* (Lepeletier)

Leaf mining damage to birch in the northern rural forests was rare. Damage to ornamental and road side birch in northern Wisconsin was generally lower than in 1994 and occurred in pockets of light to heavy mining.

Birch Skeletonizer - *Bucculatrix canadensisella* Chambers

Numerous small pockets of heavy, late-summer browning of white birch leaves occurred on north-facing slopes in Iowa and Grant counties. Total area of defoliation was about 200 acres.

BLACK WALNUT

A Shoot Borer - *Acrobasis juglanivorella* Nuenzig

Larvae damaged terminal shoots in a plantation in Winnebago county. No permanent stem deformity occurred.

BUTTERNUT

Butternut Canker - *Sirococcus clavigignenti-juglandacearum* N.B. Nair, Kostichka & Kunz

Cankered butternut trees were observed in Rusk and Sawyer counties; two previously unreported counties.

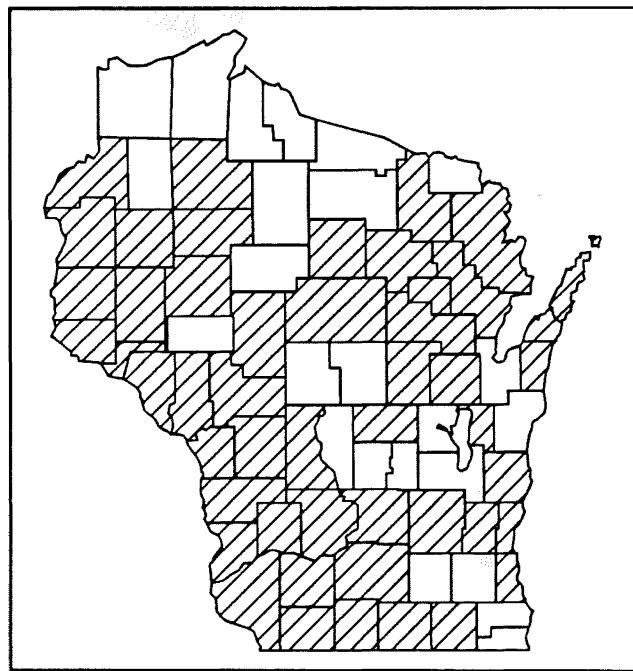


Figure 3. Known county locations of butternut canker in Wisconsin, 1995.

Activities regarding butternut canker continue to center on locating potentially resistant butternut for the USDA Forest Service grafting project; monitoring the silviculture project on the Menominee Indian Reservation (northeastern Wisconsin); and providing information to the public regarding regeneration and planting of butternut. The DNR state forest tree nursery at Hayward Wisconsin grew butternuts for distribution to the public.

The project on the silviculture of butternut was initiated in 1994 on the Menominee Indian Reservation. The objective of the project is to evaluate the survival and growth of planted butternut in various sized canopy openings on 2 habitat types. In 1995, a survey was conducted to determine the survival rate of planted seedlings. Mortality of butternut seedlings was high on many of the plots (Table 2). Dead seedlings were too deteriorated to analyze the cause. Plots that showed heavy mortality will be replanted in the spring on 1996. In the spring and fall of 1995, data were collected on the caliper and height of each planted seedling. In November, 1995 an area covering 200' in all directions around the plots was surveyed for the presence of butternut trees. Fourteen butternuts were observed within 200' of the plots on the AQVib (Acer-Quercus/Viburnum) habitat type. No butternut trees were observed surrounding the plots on the ATFD (Acer-Tsuga-Fagus/Dryopteris) habitat type (Table 3). This survey was conducted to determine the potential for various levels of disease pressure on the 2 habitat types.

Table 2. Percent mortality of butternut seedlings planted in various sized canopy openings and on 2 habitat types in the Menominee Indian Reservation.¹

HABITAT TYPE	SIZE OF CANOPY OPENING	MORTALITY (%)
AQVib	0.03a	27.8
ATFD	0.03a	27.8
AQVib	0.25a	38.3
ATFD	0.25a	28.3
AQVib	0.5a	32.1
ATFD	0.5a	27.8
AQVib	1.0a	48.8
ATFD	1.0a	29.2
AQVib	2.0a	43.8
ATFD	2.0a	23.4

¹Seedlings planted during the spring, 1995, survey conducted in fall, 1995.

Table 3. Diameter and canker status of trees within 200' of the silvicultural trial plots on the Menominee Indian Reservation, AQVib habitat type.

TREE #	DBH	CANKER STATUS
1	2.5"	possible twig canker
2	4"	cankered
3	10"	cankered
4	4"	cankered
5	5"	cankered
6	8" (triple stem)	cankered
7	2"	cankered
8	10"	cankered
9	5"	cankered
10	5"	cankered
11	8"	cankered
12	10"	cankered
13	5"	not cankered
14	8"	cankered

CHERRY

Eastern Tent Caterpillar - *Malacosoma americanum* (Fabricius)

Populations continued at normal levels. Occasional roadside and fence row trees were defoliated in the west-central and eastern counties. Numbers of tents were reduced from 1994 levels in northwestern Wisconsin. Spots of heavy defoliation occurred in Green, Rock and southern Dane counties.

Cherry Scallop Shell Moth: *Hydria prunivorata* Ferguson

Populations of this mid-summer defoliator collapsed from last year's outbreak levels in the central and northeastern counties where numbers of unsightly webbed leaves were generally scarce. Defoliation was common on black cherry near Necedah in Juneau County. Populations in northwestern Wisconsin were very low.

Uglynest Caterpillar - *Archips cerasivorana* (Fitch)

Extremely heavy defoliation occurred on choke cherry in Washburn, Burnett, Douglas, Bayfield and Polk counties.

AMERICAN CHESTNUT

Chestnut Blight - *Cryphonectria parasitica* (Murr.) Barr

Survey and disease management efforts continued on a 60 acre woodlot in LaCrosse County. This property has been surveyed annually to follow the development and management of chestnut blight since 1987. In April, 1995, a survey was conducted to locate newly infected American chestnuts and identify new cankers on previously infected trees (Figures 4,5). Infected trees were observed for dieback in the upper and outer crown, and data on tree diameter and canopy position was collected. Data summaries are presented in Figures 6-8. Cooperators from Michigan State University, Cornell University and West Virginia University have been providing expertise regarding the introduction and evaluation of the biological control agent. A hypovirus isolated from a Michigan strain of *Cryphonectria parasitica* was used to create a hypovirulent form of the fungus. The hypovirulent form was inoculated into cankers from 1992-1994 in an effort to slow the development of the virulent form of chestnut blight. In 1995, a new virus, European in origin, was introduced into the stand. Funds for this project have been provided by the USDA Forest Service, State & Private Forestry. Inoculation efforts will continue in 1996.

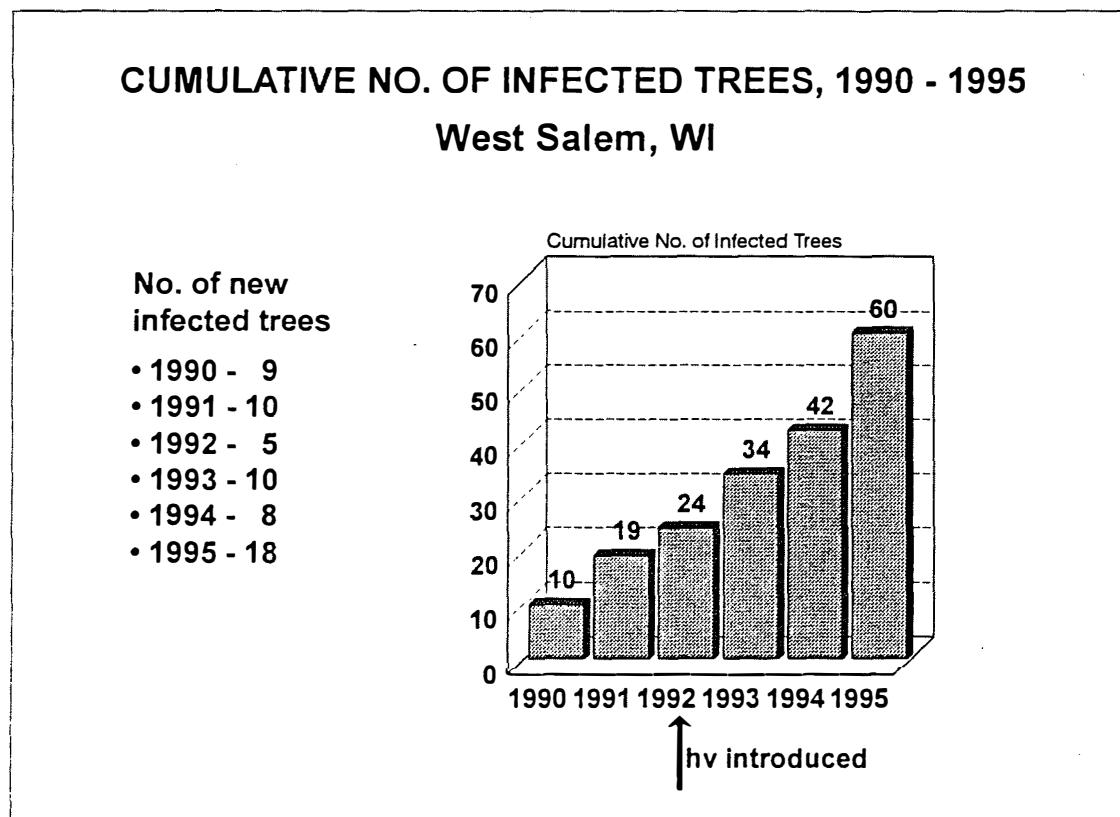


Figure 4. Number of newly infected American chestnut trees, 1990 - 1995.

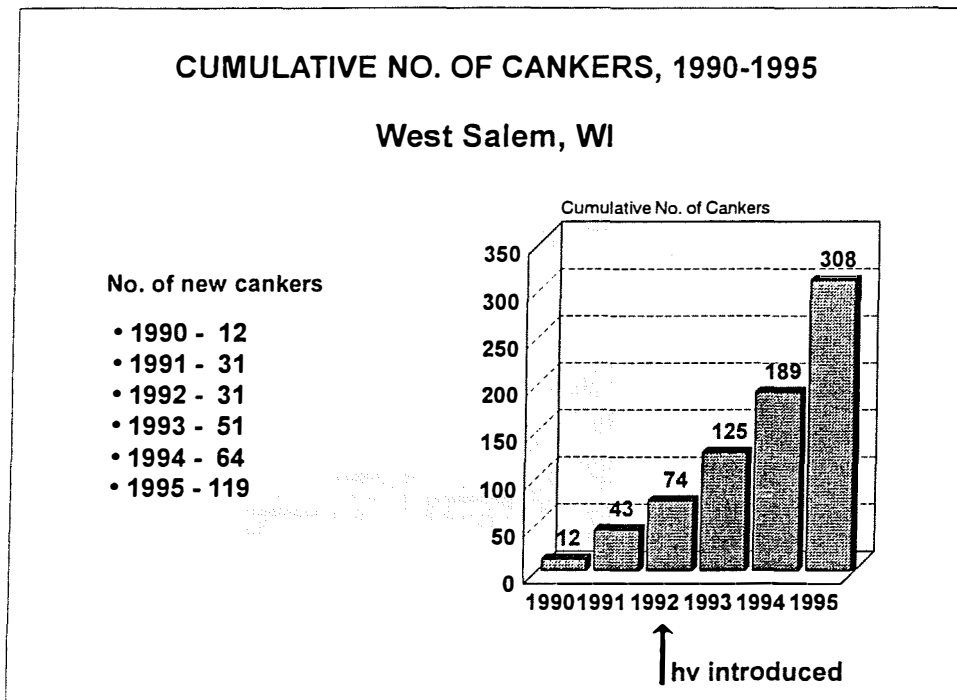


Figure 5. Number of new cankers observed on American chestnut, 1990 - 1995.

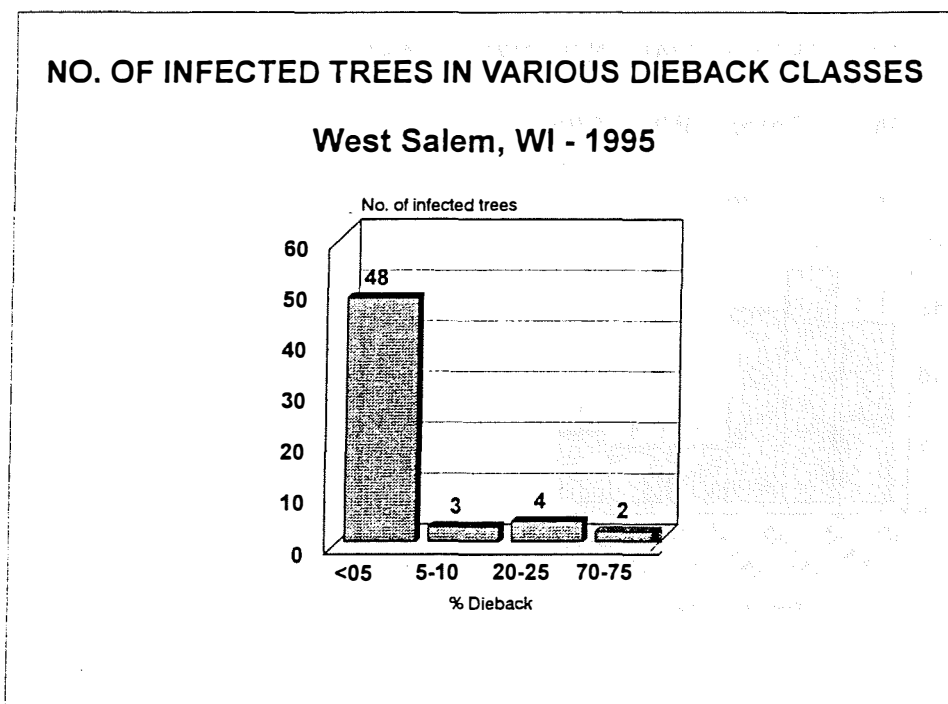


Figure 6. Number of infected American chestnut in various dieback classes - 1995.

NO. OF INFECTED TREES IN VARIOUS CROWN CLASSES

West Salem, WI - 1995

Crown Classes

- 2 = Dominant
- 3 = Codominant
- 4 = Intermediate
- 5 = Overtopped

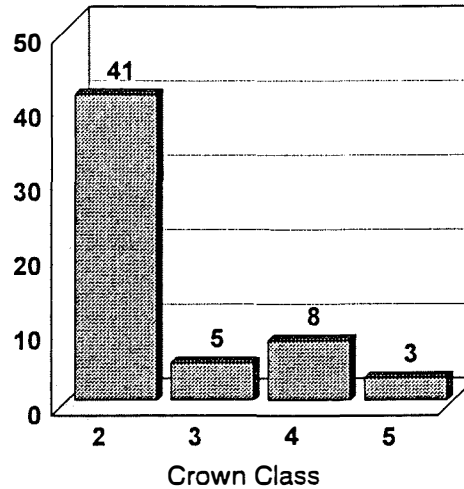


Figure 7. Number of infected American chestnut in various crown classes - 1995.

NO. OF INFECTED TREES IN VARIOUS SIZE CLASSES

West Salem, WI - 1995

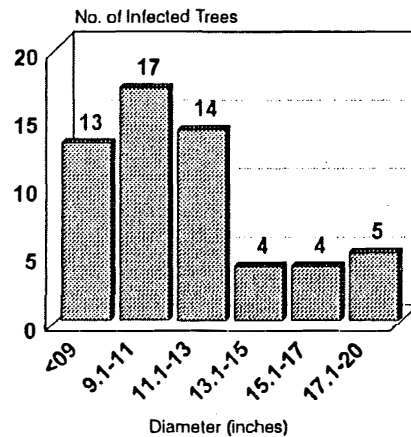


Figure 8. Number of infected American chestnut in various size classes - 1995.

CHRISTMAS TREES

Fraser Fir - Needle discoloration and casting

Heavy needle casting was observed in a 9-year-old Christmas tree plantation in Marathon County (T30N, R8E, Sec. 32, S1/2, NE1/4). This problem was caused by a hard pan creating wet soil and root rot.

Fraser fir on flat land and clay soils in the Lake Michigan District seem to suffer more from needle discoloration and casting than do those with good air and water drainage.

Lirula Needlecast - *Lirula nervata*, *L. mirabilis*

In Florence County (Commonwealth Township), an attempt was made to determine the time period of spore release of *Lirula nervata* and *L. mirabilis*. Glass slides, coated with Vaseline, were placed throughout an infested stand of balsam fir Christmas tree. The slides were changed weekly throughout the growing season. Microscopic examination of the slides revealed that identification of *Lirula* was not possible since other fungi with the same spore shape and size were present in the plantation and contaminating the slides. In 1996, a weather station will be set up in this same stand and samples will be collected every 2 weeks and examined to determine the stage of fungal development and spore release.

Table 4. Other reported pests of Christmas trees

PEST	DESCRIPTION	LOCATION (County)
<u>Balsam Gall Midge</u> - <i>Paradiplosis tumifex</i> (Gagne)	Heavy damage was reported by Christmas tree growers. Numerous trees were reported with more than half the new growth infested. Most of the infested areas occurred in partial shade or adjacent to natural balsam fir stands.	Price Langlade
<u>Balsam twig aphid</u> - <i>Mindarus abietinus</i> (Koch)	Some light damage to balsam fir Christmas trees occurred in Outagamie and Winnebago counties. Light damage to lower branches in Balsam fir Christmas tree plantations.	Outagamie Winnebago Langlade Price Taylor
<u>Cyclaneusma needlecast</u> - <i>Cyclaneusma minus</i> (Butin) DiCosmo, Peredo & Minter	Heavy needle loss was observed in a Scotch pine plantation. Both <i>Cyclaneusma</i> and <i>Lophodermium</i> were isolated from needles collected in the same plantation, which contributed to the heavy needle loss observed.	Monroe

PEST	DESCRIPTION	LOCATION (County)
<u>Cytospora Canker</u> - <i>Leucostoma kunzei</i>	Observed on Colorado blue spruce in one location.	Brown
<u>Eastern Gall Rust</u> - <i>Cronartium quercuum</i>	High levels of infection caused severe branch mortality in one Scotch pine plantation. Mortality of new shoots, causing slight flagging in the trees was observed in a Scotch pine plantation.	Monroe Jackson
<u>Eastern Pine Shoot Borer</u> - <i>Eucosma gloriola</i>	This insect was found in a Scotch pine plantation. The terminal leader was damaged on the tree.	Eau Claire
<u>False Pine Webworm</u>	Attacked same trees being damaged by jack pine budworm. Trees were rendered unsalable.	Waushara Waupaca
<u>Jack Pine Budworm</u> - <i>Choristoneura pinus</i>	Large numbers of caterpillars and heavy webbing were reported and observed in Scotch pine plantations.	Jackson Monroe Waushara Waupaca
<u>Pine Spittlebug</u> - <i>Aphrophora cribrata</i> (Walker)	Damage was heavy enough in one plantation to make scotch pines unsaleable. High numbers of spittle masses observed on Scotch Pine. Mortality of new shoots on Scotch pine.	Waupaca Waushara Monroe Jackson
<u>Root Collar Weevil</u> - <i>Hylobius radialis</i>	Scattered mortality was observed in a Scotch pine plantation.	Monroe
<u>Shoot Mortality</u> - Unknown	Dead shoots on Scotch pine were scattered throughout a plantation. A small swelling at the base of each dead shoot was observed. No evidence of hail damage, oviposition damage, or spittlebug feeding damage was evident. Eastern gall rust was suspected but not confirmed.	Jackson
<u>Yellow-Headed Spruce Sawfly</u> - <i>Pikonema alaskensis</i> (Rohwer)	Heavy defoliation of ornamental white spruce and roadside windbreaks.	Oneida Lincoln Marathon Taylor

FRASER FIR

Spruce Spidermite - *Oligonychus ununguis* (Jacobi)

Mites caused yellowing of Fraser fir needles in an ornamental planting in Crandon. There were scattered reports of this insect in northwestern and central Wisconsin.

HONEY LOCUST

Plant Bugs - *Diaphnocoris chlorionis* (Say)

Feeding damage by plant bugs caused defoliation of street trees in Green Bay, several Fox River cities and several southern counties.

LARCH

Larch Top Dieback and Mortality - Unknown

Two plantations, (Japanese/European hybrid larch and Japanese larch) on the Coulee Experimental Forest in LaCrosse County, western Wisconsin, were surveyed to determine the impact and possible progression of top dieback and mortality that was first observed in 1992. Symptoms in 1992 included top dieback, mortality, needle chlorosis, and pitchy cankers or splits in the bark. The injuries were attributed to late spring frosts in 1992. These stands were surveyed in 1993, 1994 and 1995. There was very little if any increase in the number of dead trees, trees with dead tops or trees with cankers. Many of the trees with dead tops appeared to be developing new leaders as a lateral curved upward. The injuries to these stands appears to have stabilized. These plantations were planted in 1984.

Table 5. Number of trees in various stages of health in two plantations on the Coulee Experimental Forest, LaCrosse County, 1995.

PLANTATION	HEALTHY	DEAD	DEAD TOP	DEAD TOP; LATERAL BRANCH TAKING OVER AS A NEW TOP
Hybrid larch	523	7	9	9
Japanese	486	41	23	12

Larch Needlecast - *Mycosphaerella laricina* (Hartig) Mig.

Heavy needle infections on two 45-year-old trees at the DNR headquarters at Trout Lake (T41N, R7E, Sec.8, NWNW), Vilas County.

This disease was severe on approximately 75% of the 10 acres of European larch plantation in Lorain Township of Polk County. Trees were bright orange by mid-August and bare by mid-September. There was no evidence of defoliation at the Clam Falls, Polk County site.

Larch Casebearer - *Coleophora laricella* (Hubner)

About 3000 acres of tamarack were defoliated in southeastern Wisconsin. Areas hardest hit were tamarack swamps in Sheboygan and Jefferson counties. Moderate defoliation of tamarack and European Larch occurred in Dane County. Heavy parasitism by *Agathis pumilla* (Ratzeburg) and *Chrysocharis laricinellae* (Ratzeburg) reduced the adult population so that defoliation is not expected in 1996.

MAPLE

Sugar Maple Decline Survey - North American Maple Project

Wisconsin continued to participate in the North American Maple Project, administered by the USDA Forest Service and Canadian Forestry Service. Eighteen plots, (Figure 9) (each plot a cluster of 5, 20 X 20 meter plots), were established in 1988; 9 plots have trees tapped for maple syrup, and 9 plots have trees that were not tapped for maple syrup. Each year, data on the tree vigor, dieback, discoloration, dwarfing and crown transparency have been collected. Crown dieback reflects the general, long-term health of individual trees. In 1995, the average plot-cluster dieback of upper crown sugar maples was 4.5% in sugar bushes and 3.4% in non-sugar bushes. Crown transparency reflects annual fluctuations in tree condition due to disturbances such as defoliation, drought and other stresses. The average plot-cluster transparency of upper canopy sugar maples was 10.9% in sugar bushes and 11% in non-sugar bushes. These figures are within the expected natural range of sugar maple. The overall condition of sugar maples in these plots is considered good.

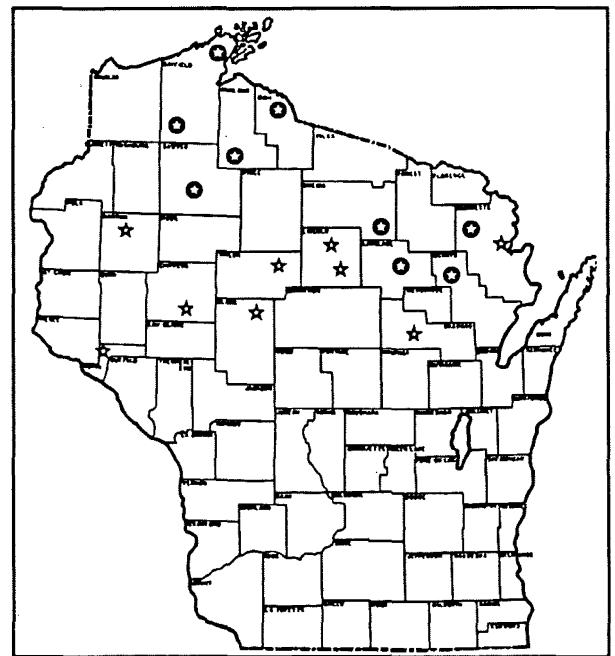


Figure 9. Location of North American Maple Project plots
Sugarbush = star
Sugar Maples not tapped = star inside circle

Sugar Maple Anthracnose - *Discula campestris* (Pass.) Von Arx

This disease was commonly observed in northwestern Wisconsin in the spring yet didn't cause any serious injury.

Sugar Maple Decline

At one site in Calumet County, mortality of sugar maple occurred due to a number of interacting factors:

- fluctuating water table
- stress from a selective harvest
- *Hypoxylon* root rot
- *Xylaria* root rot = dead man's fingers
- horntails
- ambrosia beetles

Red Maple Dieback and Mortality - Fluctuating water table

Scattered mortality of red maple was observed in northwestern Wisconsin due to beaver activity causing a rise in the water table.

Maple Trumpet Skeletonizer - *Epinotia aceriella* (Clemens)

This late summer defoliator was observed in northwestern Wisconsin but did not cause any noticeable defoliation. Very light skeletonizing was observed on sugar maples in Grant County.

Wooly Alder Aphid - *Prociphilus tessellatus* (Fitch)

Populations were locally high on silver maple in Washburn, Douglas, Bayfield and Sawyer counties.

MISCELLANEOUS

Unknown Yellowing of Spruce

Chlorosis, necrosis, and desiccation of white spruce needles was observed on 4-15' white spruce trees in St. Croix County.

Anthracnose - A variety of fungi

Reports of ash, oak, and maple affected by anthracnose were received from throughout western Wisconsin. Anthracnose caused some dropping of leaves on green ash in Kewaunee county along the shore line of Green Bay.

Rhizosphaera Needlecast - *Rhizosphaera kalkhoffii* Bub.

Ornamental white spruce and Colorado blue spruce were affected in Pierce and St. Croix counties. Douglas fir ornamentals showed moderate needle loss in Wood County, T 22N, R3E, Sec. 34, S ½, SWSE. Colorado Blue Spruce ornamentals had heavy needle loss in their lower branches in Langlade County, Bryant, Wisconsin.

Lace Bugs - *Corythucha arcuata* (Say) and *C. celtidis* Osborn & Drake

High numbers of these sapsucking insects were found on the underside of leaves of ornamental hackberry and white oak trees in Eau Claire and Trempealeau counties.

Pine Decline Complex

A combination of Zimmerman pine moth and Armillaria root rot is caused decline and mortality in a young jack pine plantation in Jackson County.

Road Salt Injury

Red and white pines were affected throughout western Wisconsin along major highways and roads.

Frost

Three-year-old white pine suffered frost damage in Menominee County.

Tornado Damage

One small but significant storm in northwest Wisconsin smashed up a swath of jack pine, red pine and aspen in Warden's Corner - the region where Washburn, Burnett and Douglas counties intersect.

Unidentified Sawfly on Alder

In Florence County, alders along roadsides were completely defoliated by an unidentified sawfly in late July and early August. The sawfly larvae were solid black.

Nests of fall webworm were noticeable in Brown, Outagamie, and Winnebago counties but no serious damage was observed.

The attempt to eradicate the Wisconsin gypsy moth population continued as 25 sites totaling 29,685 acres were sprayed twice with B.t.k. and 4 sites totaling 1090 acres were mass trapped with 9 traps per acre. More than 48,500 delta traps were used for detection, delimiting, post treatment and mass trapping. Egg mass surveys were conducted in areas that yielded high numbers of trap catches. About 125 state and federal personnel were employed in the 1995 program.

The egg parasite *Ooencyrtus kuvanae* (Howard) emerged from egg masses collected in Brown, Manitowoc, Kewaunee and Door counties.

Mountain-ash Sawfly - *Pristiphora geniculata* (Hartig)

TOTAL MOTIS - 104,918

State	Count
Alaska	0
Arizona	0
Arkansas	0
California	13933
Colorado	72
Connecticut	0
Delaware	0
Florida	104
Hawaii	13933
Idaho	0
Illinois	104
Indiana	0
Iowa	0
Kansas	0
Kentucky	0
Louisiana	0
Maine	0
Maryland	0
Massachusetts	0
Michigan	0
Minnesota	0
Missouri	0
Montana	0
Nebraska	0
Nevada	0
New Hampshire	0
New Jersey	0
New Mexico	0
New York	0
North Carolina	0
North Dakota	0
Ohio	0
Oklahoma	0
Oregon	0
Pennsylvania	0
Rhode Island	0
South Carolina	0
South Dakota	0
Tennessee	0
Texas	0
Utah	0
Vermont	0
Virginia	0
Washington	0
West Virginia	0
Wisconsin	0
Wyoming	0

19

OAK

Oak Wilt - *Ceratocystis fagacearum* (Bretz) Hunt

Oak wilt is present throughout west-central and southwest Wisconsin (Figure 11) however, it is most prevalent around new home and other construction sites. In northeastern Wisconsin, observations continue to be made on disease development around Crivitz and Niagra (Marinette County). Trees continue to die in these areas. In north-central Wisconsin, new infection sites were observed in Marathon County in the city of Mosinee. The city cooperated with a contractor to break the root grafts and remove the infected trees. New centers of infection were very rare in southern and southeast Wisconsin. Spread within existing pockets was slow and occurred very late in the season.

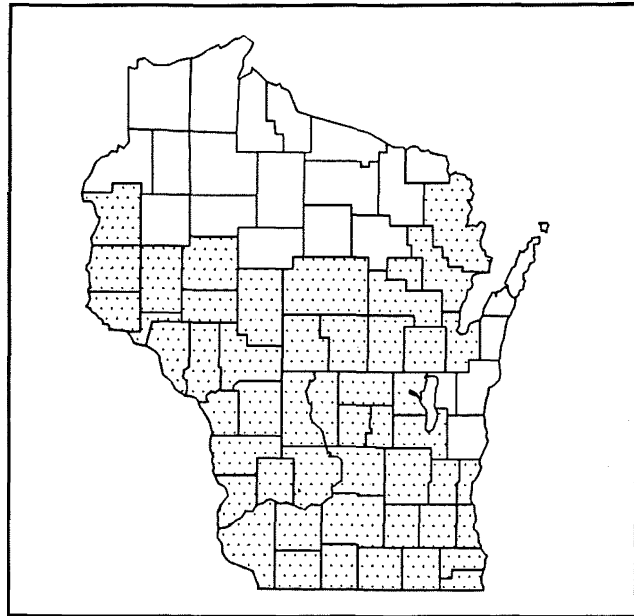


Figure 11. Known county distribution of oak wilt in Wisconsin, 1995.

Oak Wilt Survey - WI DNR and WI Power & Light

A 5-year cooperative survey for oak wilt was initiated in 1995 between WI DNR and Wisconsin Power & Light. The objective of the survey was to determine whether or not the pruning practices conducted by Wisconsin Power & Light are contributing to the overland spread of oak wilt. The following time periods are being evaluated:

1. Pruning conducted from April 15 - July 1. Wounds treated with a tree wound dressing.
2. Pruning conducted from July 2 - September 15. Wounds not treated.

Approximately 14 locations in 3 counties were surveyed both by ground and air in 1995 (Table 6). All locations were those that had been pruned between April 15 and July 1; all wounds had been treated. Of the 184 red oaks and 90 white oaks pruned and treated from April 15 to July 1, 2 red oaks showed symptoms of oak wilt. Samples were collected from the 2 trees and the presence of oak wilt was confirmed by the Wisconsin Dept. of Agriculture, Trade and Consumer Protection. The 2 wilted trees most likely contracted oak wilt through root graft spread from nearby trees killed by oak wilt in 1994. Each location where oak wilt occurred was mapped and confirmed that root graft spread was likely based on the size of the dead and newly infected trees and the distance between the trees. This survey will continue in 1996.

Table 6. Number of white and red oak group oaks pruned in April, May and June; oak wilt cooperative survey project, WI DNR & WI Power & Light.

County (Map #)	APRIL		MAY		JUNE	
	White	Red	White	Red	White	Red
Columbia (C5)	0	0	0	0	3	16
Columbia (C40)	0	0	0	1	1	9
Iowa (K37)	0	0	4	77	0	0
Iowa (K48)	0	23	42	27	0	0
Sauk (B9)	0	0	1	4	0	1
Sauk (B10)	0	0	14	37	25	19
Sauk (B11)	0	0	0	15	0	17
Sauk (B26)	0	2	0	0	0	0
Sauk (K50)	0	0	0	7	0	0
TOTAL	0	25	61	97	29	62

Oak Decline Complex

A combination of high water table, two-lined chestnut borer, and Armillaria root rot is causing decline and mortality of oaks in Clark County.

Oak Anthracnose - A variety of fungi

This disease produced heavy browning and leaf fall in the lower crowns of white oak in Washburn and Burnett counties.

Orangestriped Oakworm - *Anisota senatoria* (J.E. Smith)

Moderate defoliation occurred on open-grown oaks in Eau Claire County.

Treehoppers

Large numbers of this insect were found on oak sprouts in Eau Claire and Monroe counties.

Oak Sprout Canker - *Botryodiplodia gallae* (Schwein.)

This canker was observed on young oak sprouts in Marinette county, northeastern Wisconsin. Heavily infected sprouts were killed by this fungus.

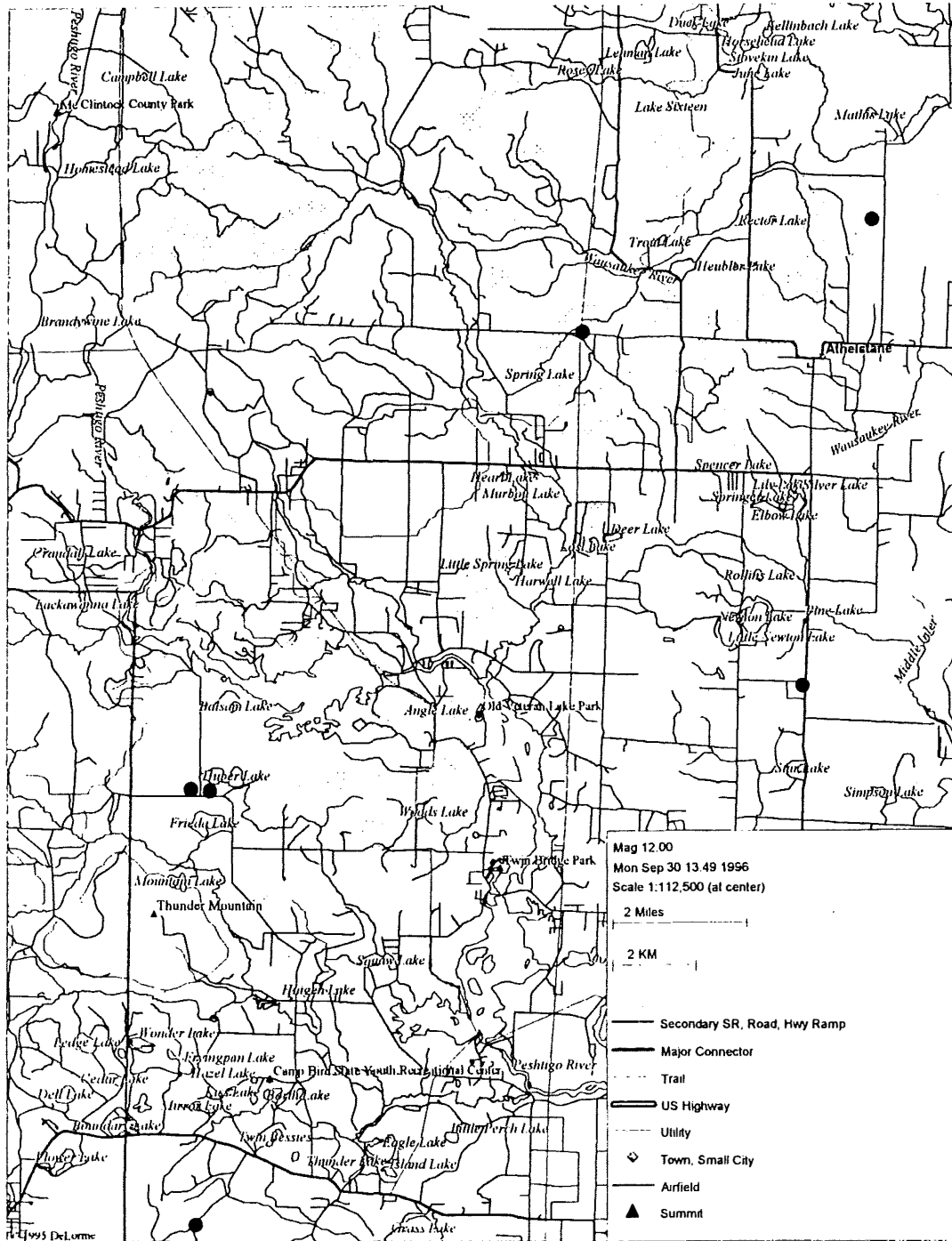


Figure 12. Six known locations of oak sprout canker (indicated by black dots) in Marinette County, WI 1995.

Gall-like Scale - Kermisidae

A Kermisid scale is damaging planted red oaks in Grant, Richland and Vernon counties. The species has not been positively identified but is believed to be *Allokermes galliformis*. It damages oak twigs by sucking sap from the twigs. Heavy populations are causing twig mortality and stunting of younger trees.

The numbers of adult female scales are very high in red oak plantations less than 5 years old. They decrease as the plantations grow older. Parasitism is very high in a Grant County plantation where three species of parasitic wasp were recovered from adult female scales; identification is pending.

Forest Tent Caterpillar - *Malacosoma disstria* (Hubner)

Light defoliation of white oaks occurred in Dunn County.

Two-lined Chestnut Borer - *Agrilus bilineatus* (Weber)

Oak mortality caused by this borer was very light throughout Wisconsin. A late-summer aerial survey in south-central and southwestern Wisconsin revealed very little oak mortality.

Oak Skeletonizer - *Bucculatrix ainsliella* Murtfeldt

A handful of sites in Brown County suffered defoliation by this pest. Very light skeletonizing of red oaks was common and wide spread in the southern counties. No heavy skeletonizing was reported.

Oak Leaf Tier - *Croesia semipurpurana* (Kearfott)

High populations occurred across Washburn County and into western Sawyer County. A moderate thinning of oak crowns was observable over several thousand acres. The larvae attracted great numbers of predatory calosoma beetles.

Lecanium Scale - *Parthenolecanium quercifex* (Fitch)

This pest caused flagging of sapling oaks in Marinette and Oconto counties. Scales were tended by ants which allowed the population to increase to damaging levels. Taller trees were not injured.

Oak Decline (Construction Stress)

Stress from soil compaction and increased exposure to light caused oaks to decline in vigor at several sites in Brown County.

PINE

Root Rot of Red Pine - *Heterobasidion annosum* (Fr.; Fr.) Bref. [syn. *Fomes annosus* (Fr.; Fr.) (Cooke)]

This disease was first identified in Wisconsin in 1993. Efforts concentrated on following disease progression in one of the two known locations of annosum root rot. The root rot pocket in the Arena school forest, Iowa County, was mapped and symptom development described in 1994. This process was repeated in 1995. No new trees were observed in this pocket that showed symptoms of infection. Observations of the two known pockets will continue in 1996. A cooperative survey to determine the distribution of annosum root rot in Wisconsin and the time of year spores are dispersed, is also planned for 1996

Needle Discoloration of Red Pine - Unknown

Three stands of red pine in Vilas County, north-central Wisconsin, showed symptoms of needle discoloration. The 1995 needles exhibited reddish coloration in late August and early September. The lower third of the needle was green with the outer portion discolored.

Stand 1: Planted in 1986, 27 acres; PMV habitat type, Keweenaw sandy loam.

Stand 2: Planted 1984, 58 acres, PMV habitat type. T41-42N, R10-11E, Sec. 10, NESE and SESW.

Stand 3: Planted approximately 1984. T42N, R8E, Sec.13, S ½ NE 1/4

Less than one-half of the trees in each stand showed symptoms. The discoloration on the trees occurred from the ground to 4.5 feet above the ground. Portions of the trees above this height were normal green. The symptoms were first observed in late August. The 1996 buds appeared normal.

Red Pine Shoot Blight - *Sirococcus conigenus* (DC.) P. Cannon and Minter

No increase was observed in this disease in the areas newly reported in Douglas (T45N, R11W, Sec. 25, SE1/4) and Bayfield (T46N, R9W, Sec. 27, SE1/4, SW1/4) counties. A previously unreported area with shoot blight was observed in Washburn County (T40N, R11W, Sec. 3, SWNW), Springbrook township (Figure 13). Heavy infection occurred in a 40-year-old stand in Langlade County (T34N, R9E, Sec. 17, NWSE).

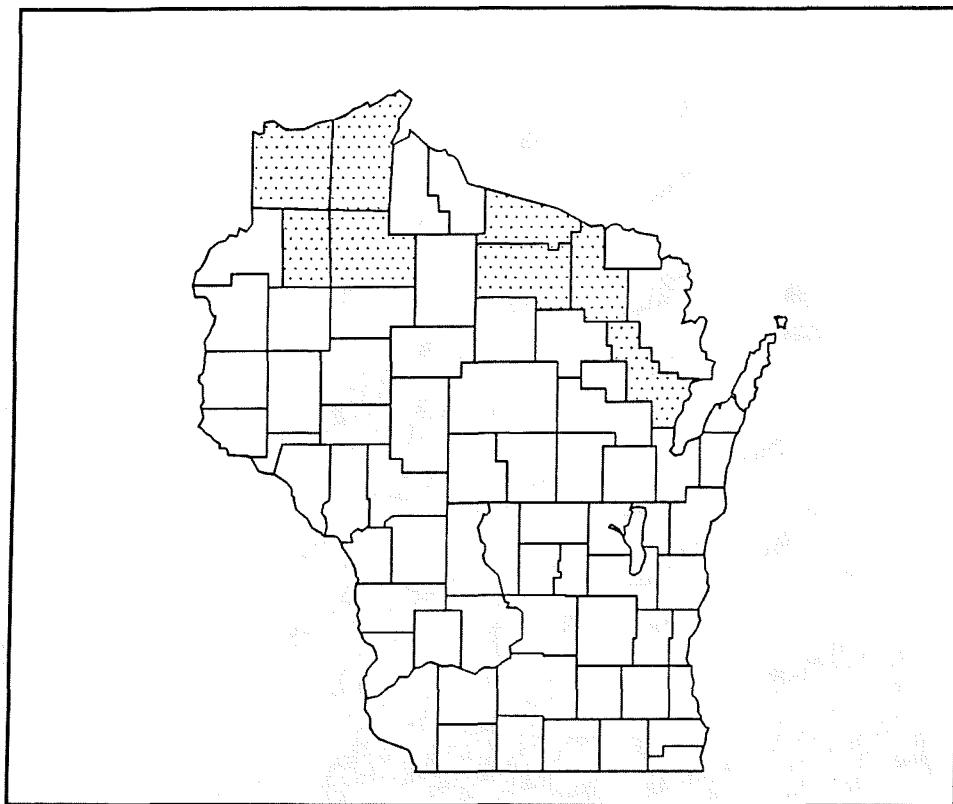


Figure 13. Known locations of red pine shoot blight in Wisconsin, 1995.

A survey was conducted for this disease on the Northern Highland American Legion State Forests and adjoining lands in Oneida and Vilas counties. Forty-nine locations were surveyed to determine the level of infection (Figure 14). The infected sites were widely distributed on the Northern Highland State Forest. Red pine was the only species confirmed to have the pathogen. The early history of the pathogen on the forest is well documented, but its distribution throughout the forest has been unknown.

High levels of shoot damage from frost and shoot blight pathogens are common in the Boulder Junction flats (Vilas county, Wisconsin) and outlying frost-prone sites. The forest habitat type for these sites is AQV, or *Acer-Quercus/Vaccinium*, on outwash, nutrient poor sands.

In recent years, age, stand deterioration and the jack pine budworm have lead to excessive mortality of the jack pine, while remnants of old red pine stands remain scattered across the Boulder flats. The lower crowns of the red pines exhibit the presence of *Sirococcus* shoot blight. Volunteer white pine is growing on these sites and has not been affected by frost or shoot blight. White pine could be planted on these sites. Cooperative efforts between WI DNR and the USDA Forest Service, State & Private Forestry are underway to determine the long term impact of these infestations.

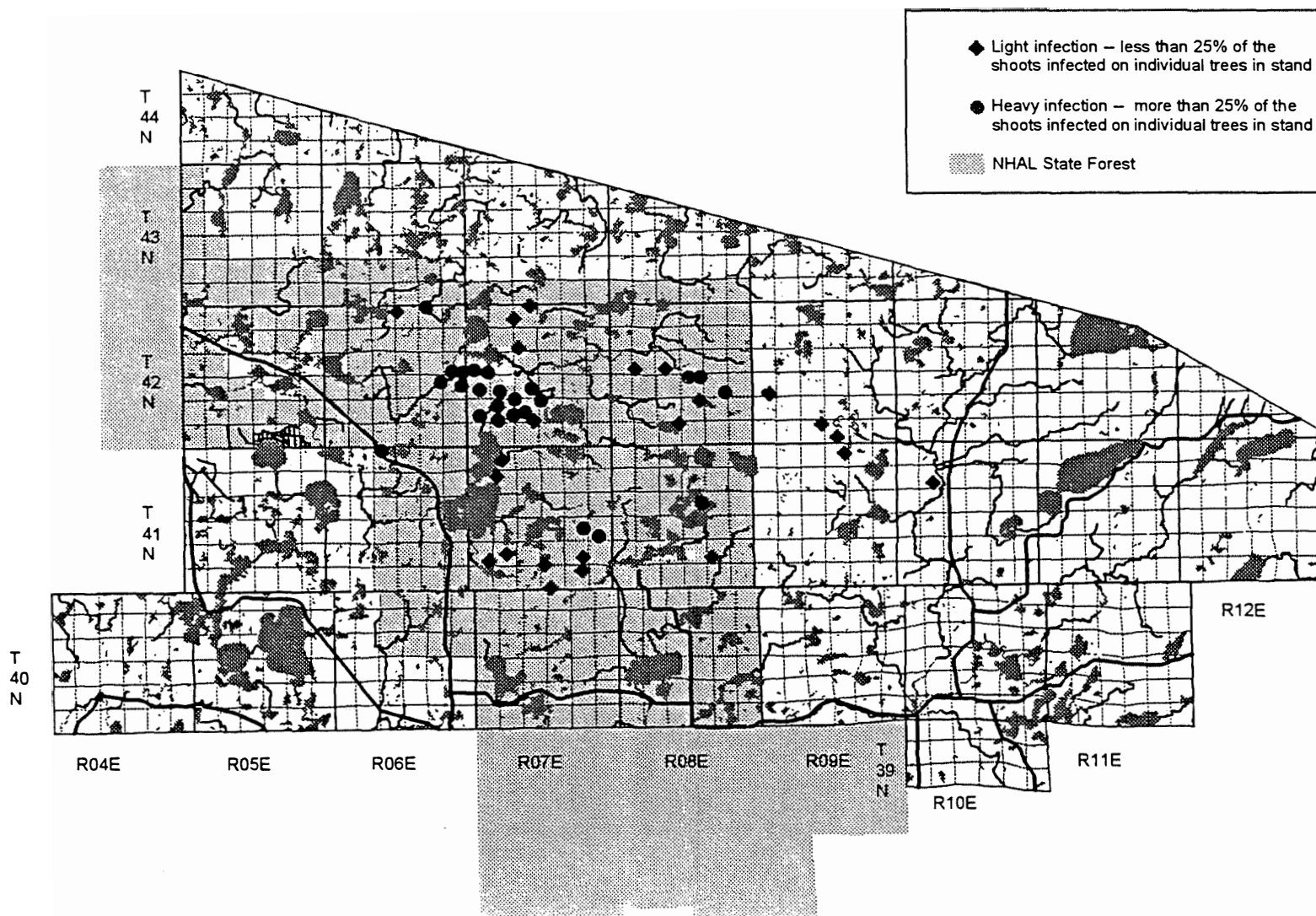


Figure 14. Locations of red pine stands infected with *Sirococcus conigenus*.

Table 7. *Sirococcus conigens* Survey 1995. Level of infection at sites in the Northern Highland American Legion State Forest, Vilas County, WI. (Prepared by Dr. W. H. Kearby)

**Level of
Infection Legal Description**

Heavy	T42N, R6E, Sec. 24, NWNW
Heavy	T42N, R6E, Sec. 24, NENW
Heavy	T42N, R6E, Sec. 13, SWSW
Heavy	T42N, R6E, Sec. 13, SENE
Heavy	T42N, R7E, Sec. 18, S 1/2
Heavy	T42N, R7E, Sec. 19, All
Heavy	T42N, R7E, Sec. 17, SWSW
Heavy	T42N, R7E, Sec. 20, All
Heavy	T42N, R7E, Sec. 29, E 1/2
Heavy	T42N, R7E, Sec. 32, NENW
Heavy	T42N, R7E, Sec. 21, NW 1/4
Heavy	T42N, R7E, Sec. 28, NWNE
Heavy	T42N, R7E, Sec. 27, NWNW
Light	T42N, R7E, Sec. 28, S 1/2
Light	T41N, R7E, Sec. 5, SWNE
Light	T41N, R7E, Sec. 5 SENW
Heavy	T41N, R6E, Sec. 4, NWNE
Heavy	T42N, R6E, Sec. 2, NENW
Light	T42N, R6E, Sec. 4, SENE
Light	T41N, R7E, Sec. 30, SWNE
Light	T41N, R7E, Sec. 29, SWNE
Light	T41N, R7E, Sec. 30, NENE
Light	T41N, R7E, Sec. 27, SWSW
Light	T41N, R7E, Sec. 27, SWNE
Light	T41N, R7E, Sec. 26, NESE

**Level of
Infection Legal Description**

Light	T41N, R7E, Sec. 34, NESE
Heavy	T41N, R7E, Sec. 23, NE 1/4
Heavy	T41N, R7E, Sec. 24, SENE
Heavy	T41N, R7E, Sec. 24, SESE
Light	T41N, R8E, Sec. 26, SWNW
Heavy	T41N, R8E, Sec. 15, SENE
Heavy	T41N, R8E, Sec. 14, NWSE
Light	T41N, R9E, Sec. 3, NWNE
Light	T42N, R9E, Sec. 34, SESW
Light	T42N, R9E, Sec. 33, NENE
Light	T42N, R9E, Sec. 19, SESE
Light	T41N, R10E, Sec. 8, SWNE
Heavy	T42N, R8E, Sec. 23, SWNE
Heavy	T42N, R8E, Sec. 22, NWNE
Heavy	T42N, R8E, Sec. 22, NWNW
Heavy	T42N, R8E, Sec. 21, NENE
Light	T42N, R8E, Sec. 27, NWNE
Light	T42N, R8E, Sec. 27, NWNW
Light	T42N, R8E, Sec. 34, SWNW
Light	T42N, R8E, Sec. 16, SWSW
Light	T42N, R8E, Sec. 17, SWSW
Light	T42N, R7E, Sec. 4, NWNE
Light	T42N, R7E, Sec. 4, NWSW
Light	T42N, R7E, Sec. 9, NESW
Light	T42N, R7E, Sec. 25, SWNE

A Shoot Moth - *Dioryctria* sp.

Terminal leaders of jack pine in Chippewa County were bored out by a caterpillar, sometimes down to the first whorl. Leaders of infected pines were bent over, with very little pitch present.

Red Pine Shoot Moth

Light infestations of red pine shoots were found in Trempealeau County.

Jack Pine Budworm - *Choristoneura pinus* (Rohwer)

In northwestern Wisconsin, the population of jack pine budworm declined moderately in 1995. Acres of defoliation declined from 42,000 to 17,000, however, the intensity of defoliation increased in Gordon township, Douglas County, WI. A late larval survey indicated about a 36% decline in budworm numbers (Table 8). However, this decline was not consistent over the entire budworm infestation in northwestern Wisconsin; there was a steep decline in Washburn, Polk and Burnett counties; a static population in Douglas county; and a slightly increasing population in Bayfield County (Figures 15,16). *Itoplectis conquisitor* remained the dominant pupal parasite comprising 44% of the predator and parasite complex (Table 9). Pupal parasitism increased slightly (Table 10) in 1995, while egg parasitism took a big jump. Percent egg hatch in 1994 was greater than 70% while in 1995, it was 51%.

Table 8. Jack pine budworm- 1995 late larval populations.

County	# of Larvae/ 15" Branch		% Change	% of High Plots ¹	
	1994	1995		1994	1995
Polk	2.61	0.43	-84	46.7	0
Burnett	1.46	0.61	-58	13.0	4.3
Washburn	1.20	0.41	-66	10.0	0
Douglas	1.16	1.14	-2	9.4	3.8
Bayfield	0.73	0.86	+18	0	7.1
District	1.29	0.82	-36	12.3	3.6

¹ A high plot has an average of 3 or more larvae / 15" branch

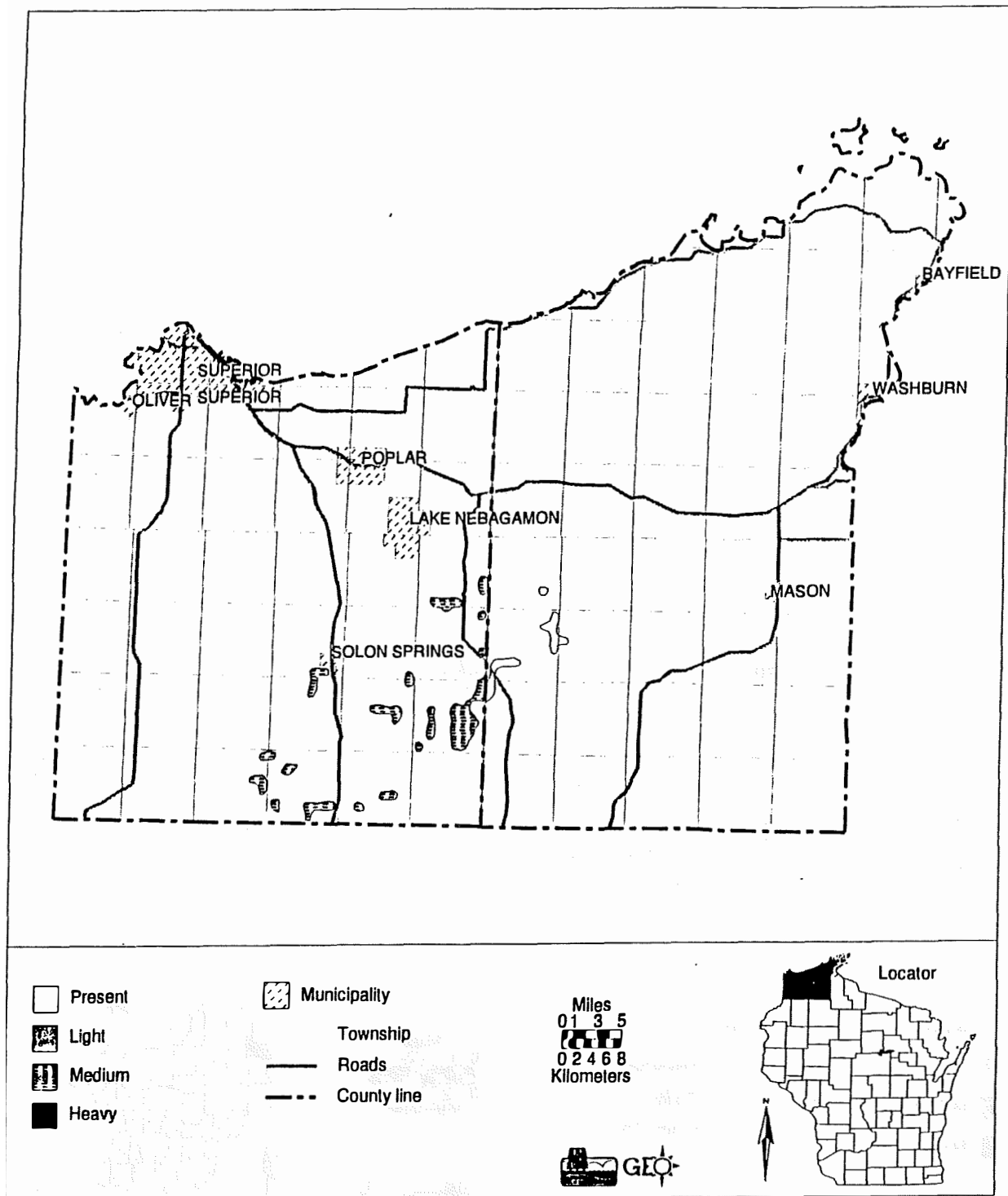


Figure 15. Area of jack pine defoliated by the jack pine budworm, Bayfield and Douglas counties, 1995.

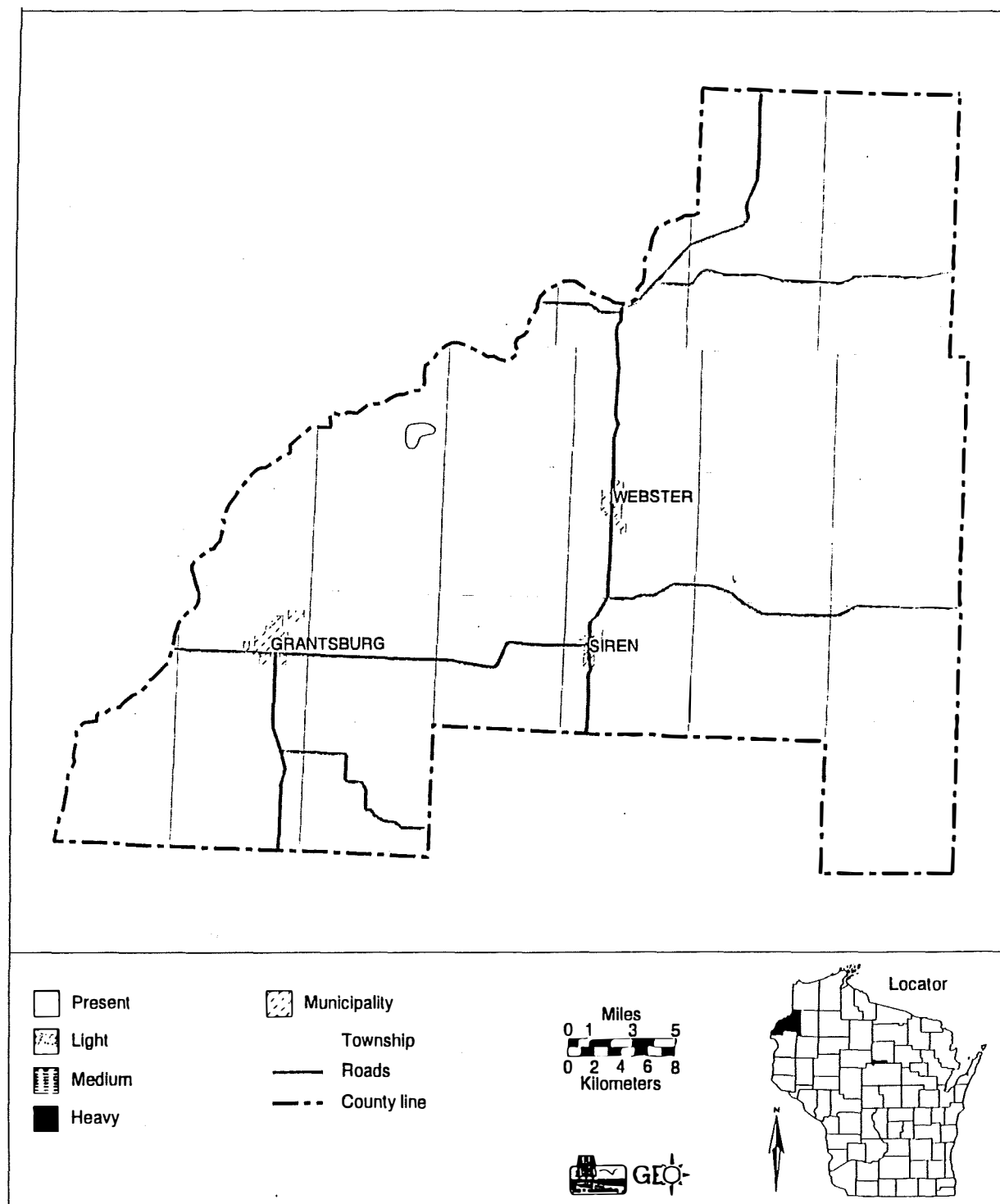


Figure 16. Area of jack pine defoliated by the jack pine budworm, Burnett County, 1995.

Table 9. Jack pine budworm predator and parasite complex¹.

Parasite/Predator	Total	% of Parasite	% of Total Pupae Examined
Itoplectis	124	44.0	16.8
Scambus	19	6.7	2.6
Phaogenes	39	13.8	5.3
Pteromalids	3	1.1	0.4
Tachinids	38	13.5	5.2
Unknown/ Ichneumonid	1	0.4	0.1
Predators	58	20.5	7.9

¹ Percent of budworm pupae killed by parasites and predators.**Table 10.** 1995 Jack pine budworm pupal survey¹.

County	Total Pupae	Total Minutes	Pupae/ Min.	Moths # %	Parasites # %	Non-emerged # %
Polk	63	90	0.70	39 61.9	18 28.6	6 9.5
Burnett	64	127	0.50	33 51.6	23 35.9	8 12.5
Washburn	57	120	0.48	34 59.7	17 29.8	6 10.5
Douglas	419	343	1.22	202 48.2	174 41.5	43 10.3
Bayfield	133	146	0.91	61 45.9	50 37.6	22 16.5
District	736	826	0.89	369 50.1	282 38.3	85 11.6

¹ This is a timed search survey. If at least five pupae have not been found within five minutes, then the survey is finished. However, if five or more pupae are found within five minutes, the search continues until 25 pupae are found or 15 minutes elapse. If 25 pupae are found, the time elapsed is recorded.

Jack pine budworm outlook for 1996 in northwestern Wisconsin:

The population has collapsed totally in Washburn, Burnett and Polk counties; only one egg mass was found in the three counties combined.

There is a small chance that Douglas and Bayfield counties may experience some defoliation in 1996 yet there is a good chance that parasitism by *Trichogramma* will cause this population to decrease below damaging levels.

The budworm populations in Clark, Dunn, Eau Claire, Jackson, and Monroe counties declined for the second straight year. No defoliation occurred. During the early larval survey, understory white pine in Jackson and Monroe counties supported high numbers of caterpillars. Later in the season these caterpillars had disappeared.

Several pockets of overmature jack pine totaling 206 acres were heavily defoliated on the Northern Highland American Legion State Forest in Vilas County. In addition, a total of 550 acres (16,000 cords) was harvested due to previous jack pine budworm populations.

Populations in Marinette and Oconto counties decreased again this year with only a few sites having even moderate damage. Defoliation at one site in Florence County, however, was heavy and the egg mass survey indicates the population at this site will be high again next year. This site is now scheduled for harvest and will be cleared before next spring.

Pine Tussock Moth - *Dasychira pinicola* (Dyar)

In 1995, the population of pine tussock moth in northwestern Wisconsin, dropped dramatically. The bulk of the population decline was caused by heavy infection by the fungus *Beauveria* during the 1994-1995 overwintering population. Fungal infection of larvae was already widespread in late fall of 1994 and had virtually wiped out the population over most of the area by spring (Table 11). A small population persisted but there was no visible defoliation anywhere in northwestern Wisconsin. Egg mass surveys indicated an 86% decline in population from 1994 to 1995 (Table 12).

Table 11. Pine tussock moth larval population 1994 - 1995.

Plots/ Twp ²	1994 Larvae		1995 Larvae		% Change	Plots Increasing		Plots Static		Plots Decreasing		1994 Plots Threshold ³		1995 Plots Threshold ³	
	Total	Mn ¹	Total	Mn ¹		#	%	#	%	#	%	#	%	#	%
W 11	72	6.5	16	1.5	-78	1	9.1	2	18.2	8	72.7	5	45.5	1	9.1
G 22	138	6.3	44	2.0	-68	3	13.6	1	4.5	18	81.8	10	45.5	2	9.1
SS 7	65	9.3	16	2.3	-75	0	0	0	0	7	100	5	71.4	0	0
H/B 32	218	6.8	141	4.4	-35	8	25.0	3	9.4	21	65.6	18	56.3	10	31.3
Total	493	6.8	217	3.0	-56	12	16.7	6	8.3	54	75	38	52.8	13	18.1

¹ Mean per plot.² W = Twp. Wascott, G = Twp. Gordon, SS = Twp. Solon Springs, H/B = Twps. Highland & Barnes³ Damage threshold for pine tussock moth is six or more larvae/plot.

Table 12. Pine tussock moth egg mass population trends 1994 - 1995.

Twnsp	# Plots	1994 Egg Masses		1995 Egg Masses		% Change	1994 Plots Threshold ²		1995 Plots Threshold ²	
		Total	Mean ¹	Total	Mean ¹		#	%	#	%
Wascott	11	147	13.4	0	0.0	-100	1	9.1	0	0
Gordon	30	735	24.5	8	0.3	-98.9	12	40.0	0	0
Solon Springs	7	203	29.0	11	1.6	-94.6	3	42.9	0	0
Highland	34	2179	64.1	426	12.5	-80.4	28	82.4	6	17.6
Barnes & Hughes	13	75	5.8	10	0.8	-86.7	0	0	0	0
Total	95	3339	35.1	455	4.8	-86.4	44	46.3	6	6.3

¹ Mean per plot.² Pine tussock moth egg mass damage threshold is 25 or more egg masses/ plot.

Pine Needle Rust - *Coleosporium asterum* (Dietel) Sydow

Jack pine in Eau Claire and Monroe counties were found infected with this disease.

Needle rust infected red pine in Menominee and Langlade counties. No permanent damage was done.

Infection was widespread in Washburn, Douglas, Bayfield, Sawyer and Burnett counties.

Grasshopper Damage

Grasshoppers damaged leaders on seedling white pine and white pine Christmas trees in Kewaunee and Manitowoc counties. The dry summer favored the hoppers that moved into neighboring tree plantations when hay and cereal crops were cut in September.

Red Pine Sawfly - *Neodiprion nanulus nanulus* Schedl

An 1994 infestation in southern Douglas County collapsed in 1995.

Introduced Pine Sawfly - *Diprion similis* (Hartig)

Populations were generally very low over all of Wisconsin. No noticeable defoliation occurred. Small numbers of larvae were observed and reported in Monroe and Crawford counties.

Saratoga Spittlebug - *Aphrophora saratogensis* (Fitch)

Surveys of Menominee County indicate numbers of this pest are low.

The major outbreak in Washburn and Burnett counties collapsed except for continued activity in frost pockets in northern Washburn county. Local populations in southern Douglas county that caused small spots of flagging in red pine plantations in 1994 erupted to create large pockets of flagging and tree mortality in 1995. Populations that began increasing in 1994 in Solon Springs and Highland collapsed in 1995.

Red Turpentine Beetle - *Dendroctonus valens* LeConte

Small numbers of these beetles were found in red pine plantations in Jackson and Trempealeau counties. The infested trees were also attacked by pine engraver beetles.

Pine Spittlebug - *Aprophora cribrata* (Walker)

This pest was present at several sites in Marinette and Oconto counties but damage was minor. In northwestern Wisconsin, the population of this insect was higher than endemic levels but much reduced from the very high numbers of 1993 and 1994. No visible symptoms of injury were observed.

Jack and white pines in Dunn, Eau Claire, Jackson, and Monroe counties were lightly infested. Most of the infested pines were in stands previously defoliated by jack pine budworm.

White Pine Aphid - *Cinara strobi* (Fitch)

High populations were found in Eau Claire and Vernon counties. The infested trees also had heavy sooty mold on the foliage and branches.

Pine Tortoise Scale - *Toumeyella parvicornis* (Cockerell)

This scale damaged several stands of regeneration (5-7 ft) jack pine in Oconto Co. Dry weather in June and ants (very heavy number of mounds) contributed to the population increase of the scale.

Common Pine Shoot Beetle - *Tomicus piniperda* (L.)

An intensive survey was conducted by Wisconsin Department of Agriculture, Trade and Consumer Protection and USDA-APHIS. A total of 144 bait logs were placed in 18 counties and 89 Scotch pine Christmas tree plantations were visually surveyed in 12 counties. No evidence of the shoot beetle was found.

Pine Root Collar Weevil - *Hylobius radicis*

Populations were low throughout Wisconsin.

Two thirty-year-old red pine wind breaks in Marinette County were heavily attacked and dying.

Pine Engraver - *Ips pini* (Say)

Hot, dry weather was favorable for bark beetles and populations increased in many counties.

High numbers of beetles caused tree mortality in red pine plantations in Clark, Eau Claire, Jackson, Monroe, and Trempealeau counties. Tree mortality was scattered throughout Jackson County in the old jack pine budworm outbreak areas. Some salvage harvests of red pine have been completed or scheduled in Eau Claire and Jackson counties.

Beetles contributed to decline and death of blocks of 30-year-old red pines within plantations in Brown and Waushara counties. Armillaria root rot was also a contributing factor in Waushara County. Pulpwood was left in three Waushara County red pine plantations in June but emerging beetles did not attack the standing trees.

In Wood County, heavy populations occurred in red pine slash piles (T21N, R6E, Sec. 32) and scattered mortality occurred in 25 year old red pine plantations (T21N, R6E, Sec 20, SESE & Sec. 29, NENE). Some trees were infested in summer of 1994 but did not die until summer of 1995.

In northwestern Wisconsin, elevated population levels remain in areas where jack pine budworm defoliation has occurred. Tree mortality was limited to scattered individual trees mingled with occasional small clumps of dead trees.

Red pine mortality was very low in southern Wisconsin. Outside of red pine pockets, mortality was very rare.

Prolepsis of Red Pine

Prolepsis (abnormal late-season flushing of lateral buds) was extremely heavy in young red pine plantations in Columbia and Marquette counties. The presumed cause was the record hot summer in combination with abundant rainfall. The two-inch-long shoots shade the terminal bud and will cause forking of the main stem next year in many of the trees. The red pines in this area appear to be affected by this condition until they reach about 6 feet in height.

SPRUCE

Spruce Budworm

Populations increased locally in planted white spruce in several north and central counties.

Heavy defoliation occurred in a 57-year-old stand of unthinned white spruce in Wood County (T23N, R2E, Sec. 12, NENW, NWNE, SWNE, NWSE,).

Light to heavy defoliation occurred in a 45 year old stand of white spruce in Marathon County (T26N, R3E, Sec. 17, SW1/4, SESW, NENE,). An egg survey on 4 plots, 3 trees per plot averaged 0.45 egg masses per plot.

Moderate defoliation occurred on the edge of a 35 year old white spruce plantation in Oneida County (T38N, R11E, Sec. 31 NE 1/4).

Yellowheaded Spruce Sawfly - *Pikonema alaskensis* (Rohwer)

The population of this summer defoliator decreased from previous years in northwestern Wisconsin.

Spruce Spider Mite - *Oligonychus ununguis* (Jacobi)

Spidermite feeding injury was observed on balsam fir and cedar yard trees in Eau Claire and LaCrosse counties.

Spruce Beetle - *Dendroctonus rufipennis* (Kirby)

A declining white spruce in Pierce County was attacked by these beetles.

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